

APPLICANT(S): BARTLETT, Philip Nigel  
SERIAL NO.: Not Yet Known  
FILED: Herewith  
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## AMENDMENTS TO SPECIFICATION

### In the Specification:

On page 1, line 3, please insert the following:

#### --CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a National Phase Application of PCT International Application No. PCI/GB2003/005442, International Filing Date 12 December, 2003, claiming priority of UK Patent Application GB 0229079 9, filed 12 December, 2002, which are hereby incorporated in their entirety.

#### FIELD OF THE INVENTION --

On page 1, line 9, please replace the following paragraph:

~~It should be noted that the term "battery" is used herein in its common meaning of a device that converts the chemical energy contained in its active components directly into electrical energy by means of a redox (oxidation-reduction) reaction. The basic unit of a battery is an electrochemical cell, which will comprise at least a positive electrode, a negative electrode and an electrolyte, the whole contained within a casing. Other components, such as separators, may be included, as is well known in the art. A battery may consist of one or more such cells.~~

With the following:

#### -- BACKGROUND OF THE INVENTION --

On page 2, line 1, please insert the following:

#### -- SUMMARY OF THE INVENTION --

On page 2, line 23, please insert the following:

#### -- BRIEF DESCRIPTION OF THE DRAWINGS

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The invention is further illustrated by the following non-limiting examples, with reference to the Figures, in which;

Figure 1 represents a schematic drawing showing the flow of protons on charge and discharge to and from a Pd lattice into a NiOOH positive electrode proton sink;

Figure 2 shows a comparison of the cyclic voltammetry of a 1 mm diameter  $H_1$  Pd disc (——) with that of a 200  $\mu m$   $H_1$  Ni disc (——) in 6 M KOH at 20  $mV s^{-1}$ ;

Figure 3 shows the charge/discharge behaviour of a 200  $\mu m$   $H_1$  Ni disc based supercapacitor by cyclic voltammetry at 20  $mV s^{-1}$  separated by 1 cm in 6 M KOH;

Figure 4 shows the flow of charge from the device versus potential during the 20  $mV s^{-1}$  discharge depicted in Figure 3;

Figure 5 shows the potential step charging/discharging of a  $H_1$  Ni/  $H_1$  Pd supercapacitor in 6 M KOH composed of a 200  $\mu m$   $H_1$  Ni disc with a 1  $cm^2$   $H_1$  Pd electrode in 6 M KOH;

Figure 6 shows a comparison of the first full cycle (——) of a 1  $cm^2$   $H_1$  Ni/1 $cm^2$   $H_1$  Pet supercapacitor incorporating a porous PTFE separator with the 15000<sup>th</sup> cycle ( \_ \_ ) at 500  $mV s^{-1}$ ;

Figure 7 represents a schematic drawing of the  $H_1$  electrode structure showing a pore ringed by oxidized active material  $Ni(OH)_2$  which is held in a matrix of a nickel current collector, and further showing the active material occupying 45 % of the electrode bulk area;

Figure 8 shows a cyclic voltammogram of nanostructured nickel/nickel hydroxide electrode, as prepared in Example 10;

Figure 9 shows a cyclic voltammogram of high surface area carbon electrode, as prepared in Example 10;

Figure 10 shows a cyclic voltammogram of nickel carbon supercapacitor, as prepared in Example 10;

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Figure 11 shows the potential-charge relationship of the cyclic voltammogram of nickel-carbon supercapacitor of Figure 10;

Figure 12 shows the potential step of the nickel-carbon super capacitor of Figure 10 ( $8 \text{ cm}^2$ , 93.7 mg) pulsed between 0 V and 1.4 V in 6 M KOH at 25 °C;

Figure 13 shows a cyclic voltammogram of a liquid crystal templated iron electrode between -0.3 V and -1.2 V vs. Hg/HgO in 6 M KOH at  $20 \text{ mV s}^{-1}$  and 25 °C, as prepared in Example 11;

Figure 14 shows the potential-charge relationship of the cyclic voltammogram shown in Figure 13;

Figure 15 shows a cyclic voltammogram of mesoporous nickel versus liquid crystal templated iron in a two electrode set-up between 0 V and 1.4 V in 6 M KOH at  $5 \text{ mV s}^{-1}$  and 25 °C, as prepared in Example 11;

Figure 16 shows the potential-charge relationship of the cyclic voltammogram shown in Figure 15.

#### DETAILED DESCRIPTION OF THE INVENTION --

On page 3, line 6, please insert the following:

-- It should be noted that the term "battery" is used herein in its common meaning of a device that converts the chemical energy contained in its active components directly into electrical energy by means of a redox (oxidation-reduction) reaction. The basic unit of a battery is an electrochemical cell, which will comprise at least a positive electrode, a negative electrode and an electrolyte, the whole contained within a casing. Other components, such as separators, may be included, as is well known in the art. A battery may consist of one or more such cells.--

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Please delete the following starting on page 8, line 27 and ending on page 10, line 10:

~~The invention is further illustrated by the following non-limiting examples, with reference to the Figures, in which;~~

~~Figure 1 represents a schematic drawing showing the flow of protons on charge and discharge to and from a Pd lattice into a NiOOH positive electrode proton sink;~~

~~Figure 2 shows a comparison of the cyclic voltammetry of a 1 mm diameter H<sub>2</sub> Pd disc (——) with that of a 200  $\mu$ m H<sub>2</sub> Ni disc (——) in 6 M KOH at 20 mV s<sup>-1</sup>;~~

~~Figure 3 shows the charge/discharge behaviour of a 200  $\mu$ m H<sub>2</sub> Ni disc based supercapacitor by cyclic voltammetry at 20 mV s<sup>-1</sup> separated by 1 cm in 6 M KOH;~~

~~Figure 4 shows the flow of charge from the device versus potential during the 20 mV s<sup>-1</sup> discharge depicted in Figure 3;~~

~~Figure 5 shows the potential step charging/discharging of a H<sub>2</sub> Ni/H<sub>2</sub> Pd supercapacitor in 6 M KOH composed of a 200  $\mu$ m H<sub>2</sub> Ni disc with a 1 cm<sup>2</sup> H<sub>2</sub> Pd electrode in 6 M KOH;~~

~~Figure 6 shows a comparison of the first full cycle (——) of a 1 cm H<sub>2</sub> Ni/1 cm<sup>2</sup> H<sub>2</sub> Pd supercapacitor incorporating a porous PTFE separator with the 15000<sup>th</sup> cycle (——) at 500 mV s<sup>-1</sup>;~~

~~Figure 7 represents a schematic drawing of the H<sub>2</sub> electrode structure showing a pore ringed by oxidized active material Ni(OH)<sub>2</sub> which is held in a matrix of a nickel current collector, and further showing the active material occupying 45 % of the electrode bulk area;~~

~~Figure 8 shows a cyclic voltammogram of nanostructured nickel/nickel hydroxide electrode, as prepared in Example 10;~~

~~Figure 9 shows a cyclic voltammogram of high surface area carbon electrode, as prepared in Example 10;~~

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~~Figure 10 shows a cyclic voltammogram of nickel carbon supercapacitor, as prepared in Example 10;~~

~~Figure 11 shows the potential charge relationship of the cyclic voltammogram of nickel carbon supercapacitor of Figure 10; and~~

~~Figure 12 shows the potential step of the nickel carbon super capacitor of Figure 10 ( $8\text{ cm}^2$ , 9.3.7 mg) pulsed between 0 V and 1.4 V in 6 M KOH at  $25^\circ\text{C}$ ;~~

~~Figure 13 shows a cyclic voltammogram of a liquid crystal templated iron electrode between 0.3 V and 1.2 V vs. Hg/HgO in 6 M KOH at  $20\text{ mV s}^{-1}$  and  $25^\circ\text{C}$ , as prepared in Example 11;~~

~~Figure 14 shows the potential charge relationship of the cyclic voltammogram 5 shown in Figure 13;~~

~~Figure 15 shows a cyclic voltammogram of mesoporous nickel versus liquid crystal templated iron in a two electrode set up between 0 V and 1.4 V in 6 M KOH at  $5\text{ mV s}^{-1}$  and  $25^\circ\text{C}$ , as prepared in Example 11;~~

~~Figure 16 shows the potential charge relationship of the cyclic voltammogram 10 shown in Figure 15.~~